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UTILITY PATENT APPLICATION TRANSMITTAL

Only for new nonprovisional applications under 37 CFR 1.53(b))

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First Named Inventor or Application Identifier

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APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO:

1. ☒ Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)2. ☐ Applicant claims small entity status.
See 37 CFR 1.27.3. ☒ Specification Total Pages 464. ☒ Drawing(s) (35 USC 113) Total Sheets 85. ☐ Oath or Declaration Total Pagesa. ☐ Newly executed (original or copy)b. ☐ Copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 17 completed)
[Note Box 6 below]i. ☐ DELETION OF INVENTOR(S)
Signed Statement attached deleting
inventor(s) named in the prior application, see
37 CFR 1.63(d)(2) and 1.33(b).6. ☒ Application Data Sheet. See 37 CFR 1.767. ☐ CD-ROM or CD-R in duplicate, large table or Computer
Program (Appendix)8. ☐ Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)a. ☐ Computer Readable Form (CRF)

b. Specification Sequence Listing on:

i. ☐ CD-ROM or CD-R (2 copies); orii. ☐ paperc. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☐ Assignment Papers (cover sheet & document(s))10. ☐ 37 CFR 3.73(b) Statement (When there is an assignee) ☐ Power of Attorney11. ☐ English Translation Document (if applicable)12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations13. ☐ Preliminary Amendment14. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)15. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)16. ☐ Other: _____

17. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP)

Prior application information:

Examiner

of prior application No. /

Group/Art Unit:

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CLAIMS	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
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	INDEPENDENT CLAIMS (37 CFR 1.16(b))	12-3 =	9	X \$ 80.00 =	\$ 720.00
	MULTIPLE DEPENDENT CLAIMS (if applicable) (37 CFR 1.16(d))			\$270.00 =	\$ 0.00
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19. Small entity status

- a. ☐ A small entity statement is enclosed
- b. ☐ A small entity statement was filed in the prior nonprovisional application and such status is still proper and desired.
- c. ☐ Is no longer claimed.

20. ☒ A check in the amount of \$ 1934.00 to cover the filing fee is enclosed.21. ☐ A check in the amount of \$ _____ to cover the recordal fee is enclosed.

22. The Commissioner is hereby authorized to credit overpayments or charge the following fees to Deposit Account No. 06-1205:

- a. ☒ Fees required under 37 CFR 1.16.
- b. ☐ Fees required under 37 CFR 1.17.
- c. ☐ Fees required under 37 CFR 1.18.

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DATE October 27, 2000

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Priority Claimed: Yes

IMAGE FORMATION APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to an image
formation apparatus which has an image masking control
function for performing masking not to write an image
in a non-image area, its image masking control method,
and a recording medium in which an image masking
10 control program has been recorded.

Related Background Art

 Conventionally, an image formation apparatus such
as an electrophotographic laser beam printer, a digital
copying machine or the like has an image writing range
15 which has been determined according to a sheet size.
If image writing exceeds this image writing range, an
image overreaches a sheet, toner adhered to the
overreached part then adheres to a photosensitive drum,
and the toner adhered to the drum further adheres to a
20 transfer roller, whereby this roller is polluted. Such
a state is explained in, e.g., Japanese Patent
Application Laid-Open No. 2-226262 (referred as JPA
'262 hereinafter) by the same assignee of the present
application. However, JPA '262 merely describes that
25 image overreaching in a sub-scanning direction, i.e., a
sheet carrying direction, is prevented. For example,
Fig. 2 of JPA '262 which is a timing chart of an enable

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signal ENBL represents that an image signal is passed only for a period of "true" of the signal ENBL by a signal masking an image signal VDO in the sub-scanning direction.

5 However, image overreaching occurs even in a main-scanning direction. If the image overreaching occurs in the main-scanning direction, the edge of a transfer roller 9 shown in Fig. 1 of JPA '262 is polluted by toner. When a next larger-sized sheet is fed, the
10 toner adhered to the transfer roller 9 is then adhered to the back of the fed sheet, thereby causing a phenomenon called "a back stain". Especially, when printing is performed on both faces of the sheet, this back stain always causes serious image pollution.

15 In recent years, a user's demand to effectively use a sheet by writing an image to the marginal edge of the sheet becomes strong. For this reason, it is necessary to prevent, by performing image masking of high accuracy more than the past, an image writing
20 overflow accurately at the marginal edge of the sheet if an image overreaches an image area on this sheet.

 Further, a case where plural laser beams are used to write a color image is explained in, e.g., Japanese Patent Application Laid-Open No. 57-67375 by the same
25 assignee of the present application. In this case, misregister (or deviation) of each beam makes accurate high-quality masking difficult.

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Further, recently, a multifunctional information output apparatus called a multifunctional printer (MFP) has been in demand. In this MFP, an image scanner is incorporated with a printer, and an image read by the image scanner is output to the printer as it is. When an original is read by the image scanner, if its position is dislocated or its size is small, the periphery of this original is read as black. Thus, in a case where an image signal representing the black-periphery original is printed as it is, toner is not transferred to a sheet but is adhered to a transfer roller when a sheet position is slightly dislocated, thereby causing a back stain of a next sheet. Also, when the original is slightly dislocated, the black part on the periphery of the original is easily read by the image scanner.

SUMMARY OF THE INVENTION

A first object of the present invention is to solve such problems as above, i.e., to appropriately control an image masking area in both a case where an image area is expanded to the marginal edge of a sheet according to an image input to a printer and a case where an image area dares to be limited for self-protection of printing.

A second object of the present invention is to solve such the problems as above. Concretely, in a

case where data from a host computer is expanded to an image signal for raster scanning and then printed, even if an image area is expanded to the marginal edge of a sheet, a problem is not caused easily, and thus a

5 command to reduce a masking area is received. However, in a case where an image is input from an image reader, reception of a command to reduce a masking area is inhibited for self-protection of a printer.

10 In order to achieve the above objects, the present invention is characterized by providing an image formation apparatus which performs image formation by raster scanning, comprising:

15 a masking means for masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

an input means for inputting the image signal;

a judgment means for judging an input mode of the image signal input by the input means; and

20 a control means for changing an image masking range of the masking means, in accordance with a judged result of the judgment means.

Further, the present invention is characterized by providing an image formation apparatus which performs image formation by raster scanning, comprising:

25 a masking means for masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

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an input means for inputting the image signal;

a judgment means for judging an input mode of the image signal input by the input means; and

5 a control means for inhibiting, in a mode that the image signal is input from an image reader, a change of an image masking range by the masking means, in accordance with a judged result of the judgment means.

10 Further, the present invention is characterized by providing an image masking control method for an image formation apparatus which performs image formation by raster scanning, the method comprising:

a masking step of masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

15 an input step of inputting the image signal;

a judgment step of judging an input mode of the image signal input in the input step; and

20 a control step of changing an image masking range in the masking step, in accordance with a judged result in the judgment step.

Further, the present invention is characterized by providing an image masking control method for an image formation apparatus which performs image formation by raster scanning, the method comprising:

25 a masking step of masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

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an input step of inputting the image signal;
a judgment step of judging an input mode of the
image signal input in the input step; and

5 a control step of inhibiting, in a mode that the
image signal is input from an image reader, a change of
an image masking range in the masking step, in
accordance with a judged result in the judgment step.

Further, the present invention is characterized by
providing a recording medium which has recorded an
10 image masking control program for performing masking
control of a computer to an image formation apparatus
performing image formation by raster scanning, the
image masking control program causing the computer:

15 to input an image signal;
to judge an input mode of the input image signal;
to change an image masking range in accordance
with a judged result; and

20 to mask the image signal on the periphery of a
screen in a main scanning direction and a sub scanning
direction within the image masking range.

Further, the present invention is characterized by
providing a recording medium which has recorded an
image masking control program for performing masking
control of a computer to an image formation apparatus
25 performing image formation by raster scanning, the
image masking control program causing the computer:
to input an image signal;

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to judge an input mode of the input image signal;
to inhibit, in a mode that the image signal is
input from an image reader, a change of an image
masking range in accordance with a judged result; and
5 to mask the image signal on the periphery of a
screen in a main scanning direction and a sub scanning
direction.

Further, the present invention is characterized by
providing an image formation apparatus comprising:

- 10 plural input means for inputting image data;
- a recording means for recording an image on the
basis of an image signal input by any of the plural
input means;
- a masking means for masking the image to be
15 recorded by the recording means; and
- a control means for controlling a masking area of
the masking means, on the basis of by which of the
plural input means the image data was input.

Further, the present invention is characterized by
20 providing an image formation apparatus comprising:

- a reading means for reading an original image;
- a reception means for receiving an image signal
from a host computer;
- a recording means for recording an image on the
25 basis of the image signal input by the reading means or
the reception means;
- a masking means for masking the image to be

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recorded by the recording means; and

5 a control means for controlling a masking area of the masking means, on the basis of by which of the reading means and the reception means the image signal was input.

Further, the present invention is characterized by providing an image masking control method comprising:

10 an input step of inputting an image from any of plural input means for inputting image data;
a masking step of masking the image to be recorded;

15 a masking control step of controlling a masking area in the masking step, on the basis of by which of the plural input means the image data was input; and
a recording step of recording the image on the basis of an image signal input from any of the plural input means in the input step.

Further, the present invention is characterized by providing an image masking control method comprising:

20 a reading step of reading an original image;
a reception step of receiving an image signal from a host computer;

a masking step of masking the image to be recorded;
25 a control step of controlling a masking area in the masking step, on the basis of by which of plural input means the image signal was input; and

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a recording step of recording an image on the basis of the image signal input in the reading step or the reception step.

Further, the present invention is characterized by
5 providing an image formation apparatus comprising:

a scanning means for scanning plural lasers;

an input means for inputting image data
corresponding to the plural lasers; and

10 a generation means for generating a masking signal to control light emission of each of the plural lasers, wherein the plural masking signals are generated by the generation means at mutually independent timing.

Further, the present invention is characterized by providing an image masking control method comprising:

15 a scanning step of scanning plural lasers;

an input step of inputting image data
corresponding to the plural lasers; and

20 a generation step of generating a masking signal to control light emission of each of the plural lasers, wherein the plural masking signals are generated in the generation step at mutually independent timing.

Other objects and features of the present invention will become apparent from the following detailed description and the attached drawings.

25

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing a circuit

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structure of a control system of an image formation apparatus according to the first embodiment of the present invention;

Fig. 2 is a perspective view showing a structure of a laser scanning optical system of the image formation apparatus according to the first embodiment of the present invention;

Fig. 3 is a block diagram showing a structure of a circuit for processing a signal received by a beam detector 7 of Fig. 2;

Fig. 4 is a diagram showing an inclination of multibeams of Fig. 2;

Fig. 5 is a diagram showing a state that each beam passes a slit member 8 of Fig. 2;

Fig. 6 is a sectional diagram showing a structure of the main part of the image formation apparatus according to the first embodiment of the present invention;

Fig. 7 is a block diagram showing a content of a distributor 41 of Fig. 1;

Fig. 8 is a timing chart showing timing of input and output signals of the distributor 41 of Fig. 7;

Fig. 9 is a timing chart showing timing of signals in the circuit of Fig. 1;

Fig. 10 is a block diagram showing a structure of an entire system according to the first embodiment of the present invention;

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Fig. 11 is a flow chart showing a control operation of a CPU 70 of Fig. 1 according to the first embodiment of the present invention; and

Fig. 12 is a flow chart showing a control operation according to the second embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, the embodiments of the present invention will be explained in detail with reference to the attached drawings.

(First Embodiment)

Fig. 2 shows a structure of a laser scanning optical system of an image formation apparatus according to the first embodiment of the present invention. In this drawing, numeral 1 denotes a multibeam laser which contains plural light emission sources. In the present embodiment, a four-beam laser is used by way of example. Laser beams which are emitted from the multibeam laser 1 are added with symbols L1, L2, L3 and L4 respectively. Numeral 2 denotes a collimator lens, numeral 3 denotes a polygonal mirror, numeral 4 denotes an F- θ lens, numeral 5 denotes a photosensitive drum which receives an image scanned by the laser, and numeral 6 denotes a reflection mirror. Numeral 7 denotes a beam detector (BD) which detects a main-scanning start timing, and

numeral 8 denotes a slit member which constitutes a slit (i.e., a long and slender strap open). Beams which are condensed by the F- θ lens 4 are added with symbols B1, B2, B3 and B4 respectively.

5 The laser beams passed the collimator lens 2 are deflected by the polygonal mirror 3 toward the direction indicated by an arrow of Fig. 2, condensed by the F- θ lens 4, and then scanned on the photosensitive drum 5. A part of the laser beams condensed by the F- θ lens 4 is reflected at a main-scanning start position by the reflection mirror 6 and then guided to the beam detector 7.

10 Fig. 3 shows a structure of a circuit which processes a signal received by the beam detector 7. In this drawing, numeral 10 denotes an amplifier which amplifies an electrical signal subjected to electrophotographic conversion by the beam detector 7. Numeral 11 denotes a slicer which slices an output signal of the amplifier 10 at a voltage set by a variable resistor 12 to generate a square-wave pulse. Then the square-wave pulse is output to a terminal 13.

20 Fig. 4 shows is a diagram showing an inclination of the multibeams B1, B2, B3 and B4 which are condensed by the F- θ lens 4. A line which is perpendicular to a main-scanning line SL is defined as a line L-L'. Each beam interval of the four multibeams B1, B2, B3 and B4 is assumed to be P1. In this situation, when the

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inclination of the multibeams is set to be an angle α from the line $L-L'$, a scanning line interval on the photosensitive drum 5 can be set to be P_s which is narrower than the interval P_l .

5 However, when the multibeams are inclined as above, timing at which each beam starts the main scanning becomes different. On the photosensitive drum 5, such a timing deviation is about 0.5mm between the adjacent beams. Therefore, when the image is written,
10 it is necessary to correct such the timing deviation.

 On the other hand, the generation of the masking signal for limiting an image writing range need not be corrected severely as compared with the image writing. In the range of a sheet-edge margin (ordinarily 3mm or
15 so), even if masking is not performed for each beam, it is possible to generate the masking signals for the respective beams in a mass. However, in a case where it is intended to write the image to the marginal edge of the sheet, it is necessary to eliminate or remove
20 the margin, whereby the above timing between the adjacent beams causes a problem. Thus, it is necessary to accurately perform the image masking for each beam.

 Fig. 5 shows a state that each beam passes the slit member 8 of Fig. 2. Here, a beam diameter, a slit
25 interval, an interval (or a distance) between the centers of the adjacent beams, and an interval (or a distance) between the adjacent beams are assumed to be

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dd, ds, db and da, respectively. When the slit interval ds is set to be larger than the beam diameter dd and sufficiently narrower than the interval da, it is possible to separate each beam passed the slit member 8 from others and guide the separated beam to the beam detector 7.

Fig. 6 shows a structure of the main part of the image formation apparatus according to the present embodiment. In this diagram, a folding mirror 30 is added to the optical system. Numeral 31 denotes a sheet feed cassette, and numeral 32 denotes a sheet size sensor. The sheet size sensor 32 reads information of a projection which is provided on the cassette 31 and corresponds to a sheet size, as bit information by using a microswitch or the like. Numeral 33 denotes a sheet feed roller, numeral 34 denotes a register roller, numeral 35 denotes a transfer roller, numeral 36 denotes a development roller, numeral 37 denotes a fixing roller, and numeral 38 denotes a sheet discharge tray.

The beam which was scanned by the polygonal mirror 3 and condensed by the F- θ lens 4 is folded by the folding mirror 30 and irradiated on the photosensitive drum 5, whereby a latent image is formed on the photosensitive drum 5. In synchronism with such an operation, a sheet held in the sheet feed cassette 31 is fed one by one by the sheet feed roller 33, sheet

feed timing is adjusted by the register roller 34, and then the fed sheet is carried to the photosensitive drum 5. The latent image on the drum 5 is developed by the development roller 36, a toner image obtained by the development is transferred on the sheet by the transfer roller 35, and the sheet is then passed the fixing roller 37, whereby the toner image is heated and pressed. Then the sheet is discharged to the sheet discharge roller tray 38.

Fig. 1 shows a circuit structure of a control system of the image formation apparatus according to the first embodiment of the present invention. In this diagram, numeral 40 denotes a beam detection circuit, numeral 41 denotes a distributor, and numeral 42 denotes an image signal generation unit. The beam detection circuit 40 contains the circuit of Fig. 3 entirely. When the four beams B1 to B4 are input to the beam detector 7, a detection signal having four pulses is output, and the output signal is divided into the four pulses by the distributor 41.

A main-scanning start timing signals which are divided by the distributor 41 are added with symbols BD1, BD2, BD3 and BD4 respectively. When the main scanning is started, the signal BD1 is first detected. The signals BD1 to BD4 are transferred to the image signal generation unit 42 to generate an image signal corresponding to each scanning line. Numerals 94 and

95 denote connection terminals of the image signal generation unit 42. The connection terminal 94 is connected to a host computer (not shown) which is one of image data generation sources, and the connection
5 terminal 95 is connected to an image reader (not shown) which is the other of the image data generation sources.

The content of the distributor 41 is shown in Fig. 7. A pulse signal which is output from the terminal 13
10 of the detection circuit 40 is applied to a terminal 14 of Fig. 7. In Fig. 7, numerals 15, 16, 17 and 18 denote gate circuits, numeral 19 denotes a four-value counter, and numeral 20 denotes a decoder. Numerals 21, 22, 23 and 24 denote output terminals of the
15 separated signals BD1, BD2, BD3 and BD4 respectively.

Fig. 8 is a timing chart showing timing of input and output signals of the distributor 41 of Fig. 7. In these diagrams, a pulse wave of a timing signal a represents the BD detection signals B1 to B4 having
20 four pulses applied to the terminal 14. Every time each pulse is applied, the counter 19 makes a count. When the output of the counter 19 is decoded by the decoder 20, signals corresponding to the output of the counter 19 are given at output parts C0, C1, C2 and C3
25 of the decoder 20. Then, when the output signals of the decoder 20 are transferred to the gate circuits 15 to 18 respectively, timing signals b, c, d and e of

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Fig. 8 respectively corresponding to the separated signals BD1, BD2, BD3 and BD4 can be obtained.

Fig. 1 will be again explained. In this diagram, numerals 43, 44, 45 and 46 denote gate circuits (AND circuits) respectively. The image signals passed these gate circuits 43 to 46 are applied to respective beam generation units (e.g., a not-shown laser diodes) of the multibeam laser 1 through laser drivers (DRV's) 47, 48, 49 and 50 respectively. Thus, the multibeam laser 1 outputs the laser beams L1 to L4 which are blinked according to the image signal.

Next, a masking process of an image main-scanning direction will be explained with reference to Fig. 1. In Fig. 1, numeral 51 denotes a flip-flop, numeral 52 denotes a counter, and numeral 53 denotes a clock input terminal of the counter 52. Numerals 54, 55, 56, 57, 58, 59, 60 and 61 denote digital comparators which perform comparison for the outputs of the counter 52. Numerals 62, 63, 64, 65, 66, 67, 68 and 69 denote registers, and numeral 70 denotes a CPU (central processing unit) which controls the masking process. A value is loaded from the CPU 70 to each register. Numerals 71, 72, 73 and 74 denote flip-flops (FF's) respectively.

These parts 51 to 74 constitute the unit which generates the image masking signal. A timing chart of this unit is shown in Fig. 9, and an operation of the

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image masking will be explained with reference to Fig. 9. However, for simplification of the explanation, a method in which only the signal BD1 is used as the beam detection signal will be explained hereinafter.

5 Ordinarily, the distributor 41 is often
incorporated in the image signal generation unit 42
because of the following reason. Namely, the image
signal generation unit 42 occupies comparatively a
large capacity in the image formation apparatus, and a
10 radiation noise is easily generated from this unit 42,
whereby this unit 42 is often disposed at the position
partitioned by an independent shield case (not shown)
in the image formation apparatus. When the beam
detection signals BD1 to BD4 are transferred up to this
15 position of the shield case, a delay between the
adjacent beams might become a problem. Thus, the four
beam detection signals are transferred to the image
signal generation unit 42 like a settled pulse, and the
transferred settled pulse is then divided into the
20 respective pulses. By doing so, it is possible to more
effectively reduce the difference of the individual
delay. This is the reason why the distributor 41 is
often incorporated in the image signal generation unit
42.

25 First, the beam detection signal BD1 from the
distributor 41 is applied to an set terminal S of the
flip-flop 51. Then, an operation enable signal CNTENB

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is output from a terminal Q of the flip-flop 51 to the counter 52, whereby counting of a clock applied to the clock terminal 53 is started by the counter 52.

5 A maximum value output of the counter 52 is
returned to a reset terminal R of the flip-flop 51 to
reset the flip-flop 51, whereby the level of the signal
CNTENB becomes low. Namely, the counter 52 operates
while the level of the signal CNTENB is being high.
After the counter 52 outputs the maximum value, it
10 returns to an initial state (i.e., zero-count state).

In the above, the example that only the beam
detection signal BDI is extracted by using the
distributor 41 was explained. On the other hand, when
the set terminal S of the flip-flop 51 is once
15 triggered and then set, the output at the terminal Q
does not change until a reset signal is input to the
reset terminal R. Thus, even if the output of the
detection circuit 40 is directly added to the flip-flop
51 without the distributor 41, the effect obtained is
20 the same.

Next, how to obtain the output from the counter 52
will be explained. The output from the counter 52 is
compared with the outputs from the registers 62 to 69
to which data (value) is set by the CPU 70, by the
25 respective digital comparators 54 to 61. When
coincidence is obtained in such the comparison, output
signals are generated from the digital comparators 54

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5 Namely, the comparator signals COMP1-1 and COMP1-2
from the digital comparators 54 and 55 are applied to
the flip-flop 71, the comparator signals COMP2-1 and
COMP2-2 from the digital comparators 56 and 57 are
applied to the flip-flop 72, comparator signals COMP3-1
0 and COMP3-2 from the digital comparators 58 and 59 are
applied to the flip-flop 73, and comparator signals
COMP4-1 and COMP4-2 from the digital comparators 60 and
61 are applied to the flip-flop 74. It should be
notified that, for simplification, only signal
5 waveforms of the two beams are shown and signal
waveforms of other beams are omitted.

20 Although there are phase deviations, masking signals
/MASK3 and /MASK4 are obtained similarly. It should be
noted that the symbol "/" represents that the level of
the signal in question is low and its signal function
is available. Namely, the masking signal /MASK1
25 represents that the image is masked when the level of
this signal is low, and that the image signal passes
the gate circuits 43 to 46 when the level is high.

connection terminal 94 to which a signal from the host computer (not shown) is input. The image signal generation unit 42 expands the signal received from the host computer to the image signal so as to be able to
5 form an image by raster scanning on the photosensitive drum 5.

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10 The image signal generation unit 42 has the other connection terminal 95 to which a signal from the image reader (not shown) is input. The signal from the image reader passes the image signal generation unit 42 as it is. An operation unit 93 is connected to the image signal generation unit 42. It is possible by the operation unit 93 to select and designate whether the image formation apparatus executes a mode to print the
15 data from the host computer or a mode to print the image signal from the image reader. When one of these modes is designated by the operation unit 93, a corresponding mode designation signal is transferred from the image signal generation unit 42 to the CPU 70.

20 It was explained that the CPU 70 outputs the image masking timing data of the main scanning direction according to the detection signal from the sheet size sensor 32. Further, the CPU 70 outputs an image masking signal /VMASK of the sub scanning direction.
25 Although this signal /VMASK is substantially the same as the enable signal ENBL described in Fig. 2 of JPA '262 and represented as the image masking signal, the

polarity of this signal /VMASK is opposite to that of the signal ENBL. Namely, when the level of the signal /VMASK is low, the laser is not permitted to generate a beam for image signal writing. The image masking
5 signal /VMASK is applied to the gate circuits 43 to 46, and the image signal from the image signal generation unit 42 is stopped when the level of this signal /VMASK is low.

Fig. 10 shows a structure of an entire system
10 according to the first embodiment of the present invention. In this diagram, numeral 101 denotes the entirety of the image formation apparatus, numeral 96 denotes a host computer which is connected to the connection terminal 94, and numeral 97 denotes an image
15 reader which is connected to the connection terminal 95. Numeral 98 denotes an aggregation of the gate circuits 43 to 46 of Fig. 1, and numeral 99 denotes an aggregation block of the laser drivers 47 to 50 and the laser 1 of Fig. 1. Numeral 100 denotes a masking
20 signal generation unit which is an aggregation of the counter 52 and its peripheral logical circuits 54 to 74 of Fig. 1. Fig. 10 shows the relation of the image formation apparatus 100, the host computer 96 and the image reader 97.

25 Next, a process operation which is performed by the CPU 70 when it receives the mode designation signal from the image signal generation unit 42 will be

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explained with reference to a flow chart of Fig. 11.

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10 First, in a step 101, the image input mode designation signal is received from the image signal generation unit 42. Then, in a step 102, it is judged
5 whether the designated mode is to designate data image input from the host computer 96 or the image reader 97. If judged that the designated mode is to designate the data input from the host computer 96, then in a step 103 on/off timing data of the image masking signal
10 which accords to the sheet size sent from the sheet size sensor 32 and by which the image masking area of the main scanning direction is reduced as much as possible (i.e., the image masking signal by which the image can be formed up to the sheet edge) is loaded to
15 an internal memory (not shown) of the CPU 70.

Further, the signal which is loaded to the internal memory of the CPU 70 adds a value corresponding to the positional misregister (deviation) of each beam (i.e., the value corresponding to the
20 distance db between the centers of the adjacent beams in Fig. 5) so as to correct such the positional misregister of each beam. Further, on/off timing data of the image masking signal which accords to the sheet size and which the image masking area of the sub
25 scanning direction is reduced is loaded to the internal memory of the CPU 70.

On the other hand, if judged in the step 102 that

the designated mode is to designate the data input from the image reader 97, then in a step 104 on/off timing data of the enlarged image masking signals of the main and sub scanning directions which accord to the sheet size sent from the sheet size sensor 32 (i.e., the image masking signal by which the sheet-edge margin can be provided) is loaded to the internal memory of the CPU 70.

Next, in a step 105, the data of the masking signal of the main scanning direction is loaded to the registers 62 to 69.

Subsequently, in a step 106, it is judged whether or not a print start signal is input from the image signal generation unit 42. If judged that the print start signal is input, the flow advances to a step 107 to set the level of the image masking signal /VMASK to be high in order to release the image masking in the sub scanning direction. Thus, the image signal can pass the gates 43 to 46. As described above, it should be noted that, for the main scanning direction, the image masking is performed by the operation of the counter 52 through the logical circuits 54 to 74.

Next, in a step 108, it is judged whether or not print end timing is given. A timer (not shown) started at the print start time performs time counting and then stands a flag when a time corresponding to the sheet size elapses. Thus, the above print end timing can be

known from such the flag.

When the print end timing is given, the flow advances to a step 109 to set the level of the image masking signal /VMASK to be low in order to perform the
5 image masking in the sub scanning direction. Thus, the gates 43 to 46 are closed.

Thus, the image signal is subjected to the masking in the main and sub scanning directions according to the sheet size and the image input mode.

10 In the present embodiment, the case where the scanning is performed by using the multibeams was explained. However, the present invention is of course applicable to a case where the scanning is performed by using a single beam. Further, in the present
15 embodiment, a laser beam printer was used as the printer. However, the present invention is not limited to this. For example, the present invention is similarly applicable to a light emission diode array printer.

20 (Second Embodiment)

Fig. 12 is a flow chart showing a control operation according to the second embodiment of the present invention. It should be noted that, since the latter half of this flow chart is the same as that of
25 Fig. 11 in the first embodiment, the explanation thereof will be omitted. Further, it should be noted that, since the hardware structure of the second

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embodiment is the same as that of the first embodiment, the explanation thereof will be omitted.

In the first embodiment, the image masking range is enlarged and reduced according to the image input mode. However, in the second embodiment, it is prevented by image masking that the inside of an image formation apparatus is polluted by toner overreaching an image formation area.

For this reason, in the second embodiment, the image input mode designation signal is received from the image signal generation unit 42 in a step 101. Then, if it is judged in a step 102 that the designated mode is to designate data image input from the host computer 96, then in a step 110 it is judged whether or not a command to reduce the image masking area has been issued from the operation unit 93 or the host computer 96. Then, only when the command to reduce the image masking area is issued, the masking area is reduced in a step 103 such that the image can be written to the marginal edge of the sheet.

On the other hand, in ordinary use, it gives priority to a margin being formed at the sheet edge. Namely, if it is judged in the step 102 that the designated mode is to designate data image input from the image reader 97, and if it is judged in the step 110 that the command to reduce the image masking area is not issued from the operation unit 93 or the host

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Further, the present invention is applicable to a system structured by plural equipments (e.g., a host computer, an interface device, a reader, a printer, and

the like) or to an apparatus structured by one equipment (e.g., a copying machine, a fax machine, or the like).

Further, it is needless to say that the object of the present invention can be attained in a case where a recording medium (or a storage medium) recording program codes to realize the functions of the above embodiments is supplied to the system or the apparatus, and a computer (or CPU or MPU) in this system or apparatus reads and executes the stored program codes.

In this case, the program codes themselves read from the recording medium execute the functions of the above embodiments, whereby the recording medium recording the program codes constitutes the present invention.

As the recording medium recording the program codes, for example, it is possible to use a floppy disk (FD), a hard disk, an optical disk, a magnetooptical disk, a CD-ROM, a CD-R, a magnetic tape, a non-volatile memory card (IC memory card), various ROM's (a masking ROM, a flash EEPROM, etc.), or the like.

Further, it is needless to say that the present invention includes not only the case where the functions of the above embodiments can be executed by performing the program codes read by the computer, but also a case where an OS (operating system) or the like running on the computer executes a part or all of the

actual process based on instructions of the program codes and the functions of the above embodiments can be executed by such the process.

As explained above, according to the embodiments,
5 the area in which the image is masked is changed according to the input mode of the image signal. Namely, in the printer mode that the image signal is input from the host computer apparatus, it expands the image to the marginal sheet edge, while in the mode
10 that the image signal is input from the image reader, it dares to limit the image area for self-protection of the printer. Therefore, the user's demand to effectively use the sheet by writing the image to the marginal sheet edge can be satisfied. Further, in the
15 case where the image signal obtained when the periphery of the original was read to be black is printed as it is, if the sheet is slightly misregistered from its accurate position, the toner is not transferred to the sheet but adhered to the transfer roller, whereby the
20 back stain occurs in the next sheet. However, according to the embodiments, such the drawback can be prevented.

Although the present invention has been explained by using the several preferred embodiments, the present
25 invention is not limited to them. Namely, it is obvious that various modifications and changes are possible in the present invention without departing from the spirit and scope of the appended claims.

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WHAT IS CLAIMED IS:

1. An image formation apparatus which performs image formation by raster scanning, comprising:

masking means for masking an image signal on the
5 periphery of a screen in a main scanning direction and
a sub scanning direction;

input means for inputting the image signal;

judgment means for judging an input mode of the
image signal input by said input means; and

10 control means for changing an image masking range
of said masking means, in accordance with a judged
result of said judgment means.

2. An apparatus according to Claim 1, wherein
15 said judgment means judges an image input mode
designation signal.

3. An apparatus according to Claim 1, wherein
in a printer mode that the image signal is input
20 from a host computer apparatus, said control means
causes said masking means to give to a gate circuit an
image masking signal by which an image can be formed up
to the edge of a sheet, so as to expand the image up to
the marginal edge of the sheet, and

25 in a mode that the image signal is input from an
image reader, said control means causes said masking
means to give to the gate circuit an image masking

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signal by which a margin can be provided at the edge of the sheet so as to limit an image area.

4. An apparatus according to Claim 3, wherein,
5 only when an image masking area reduction command is input, said control means causes said masking means to give to the gate circuit the image masking signal by which the image can be formed up to the edge of the sheet so as to expand the image up to the marginal edge
10 of the sheet.

5. An image formation apparatus which performs image formation by raster scanning, comprising:
masking means for masking an image signal on the
15 periphery of a screen in a main scanning direction and a sub scanning direction;
input means for inputting the image signal;
judgment means for judging an input mode of the image signal input by said input means; and
20 control means for inhibiting, in a mode that the image signal is input from an image reader, a change of an image masking range by said masking means, in accordance with a judged result of said judgment means.

6. An apparatus according to Claim 5, wherein, as
25 said input means, said apparatus has image signal input means for inputting the image signal obtained by

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reading an image from said image reader, and image signal generation means for generating an image signal on the basis of information received from a host computer apparatus.

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7. An apparatus according to Claim 5, wherein said image formation apparatus is a laser beam printer which performs scanning with multibeam, or an electronic equipment which has a laser beam printer mechanism.

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8. An apparatus according to Claim 5, wherein said image formation apparatus is a light emission diode array printer, or an electronic equipment which has a light emission diode array printer mechanism.

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9. An image masking control method for an image formation apparatus which performs image formation by raster scanning, said method comprising:

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a masking step of masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

an input step of inputting the image signal;

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a judgment step of judging an input mode of the image signal input in said input step; and

a control step of changing an image masking range in said masking step, in accordance with a judged

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result in said judgment step.

10. A method according to Claim 9, wherein said
judgment step judges an image input mode designation
5 signal.

11. A method according to Claim 9, wherein
in a printer mode that the image signal is input
from a host computer apparatus, said control step
10 causes said masking step to give to a gate circuit an
image masking signal by which an image can be formed up
to the edge of a sheet, so as to expand the image up to
the marginal edge of the sheet, and

in a mode that the image signal is input from an
15 image reader, said control step causes said masking
step to give to the gate circuit an image masking
signal by which a margin can be provided at the edge of
the sheet so as to limit an image area.

20 12. A method according to Claim 11, wherein, only
when an image masking area reduction command is input,
said control step causes said masking step to give to
the gate circuit the image masking signal by which the
image can be formed up to the edge of the sheet so as
25 to expand the image up to the marginal edge of the
sheet.

13. An image masking control method for an image formation apparatus which performs image formation by raster scanning, said method comprising:

5 a masking step of masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

an input step of inputting the image signal;

a judgment step of judging an input mode of the image signal input in said input step; and

10 a control step of inhibiting, in a mode that the image signal is input from an image reader, a change of an image masking range in said masking step, in accordance with a judged result in said judgment step.

15 14. A method according to Claim 13, wherein, as said input step, said method includes an image signal input step of inputting the image signal obtained by reading an image from the image reader, and an image signal generation step of generating an image signal on
20 the basis of information received from a host computer apparatus.

15 15. A recording medium which has recorded an image masking control program for performing masking control of a computer to an image formation apparatus performing image formation by raster scanning, said
25 image masking control program causing the computer:

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to input an image signal;
to judge an input mode of the input image signal;
to change an image masking range in accordance
with a judged result; and

5 to mask the image signal on the periphery of a
screen in a main scanning direction and a sub scanning
direction within the image masking range.

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10 16. A medium according to Claim 15, wherein said
control program causes the computer to judge an image
input mode designation signal in case of judging the
input mode.

15 17. A medium according to Claim 15, wherein said
control program causes the computer

to give, in a printer mode that the image signal
is input from a host computer apparatus, to a gate
circuit an image masking signal by which an image can
be formed up to the edge of a sheet, so as to expand
20 the image up to the marginal edge of the sheet, and

to give, in a mode that the image signal is input
from an image reader, to the gate circuit an image
masking signal by which a margin can be provided at the
edge of the sheet so as to limit an image area.

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18. A medium according to Claim 17, wherein, only
when an image masking area reduction command is input,

said control program causes the computer to give to the gate circuit the image masking signal by which the image can be formed up to the edge of the sheet so as to expand the image up to the marginal edge of the sheet.

19. A recording medium which has recorded an image masking control program for performing masking control of a computer to an image formation apparatus performing image formation by raster scanning, said image masking control program causing the computer:

- to input an image signal;
- to judge an input mode of the input image signal;
- to inhibit, in a mode that the image signal is input from an image reader, a change of an image masking range in accordance with a judged result; and
- to mask the image signal on the periphery of a screen in a main scanning direction and a sub scanning direction.

20. A medium according to Claim 19, wherein said control program causes the computer to input the image signal from the image reader at it is when an image is read by the image reader, and to generate an image signal on the basis of information when the information is received from a host computer apparatus.

21. An image formation apparatus comprising:
plural input means for inputting image data;
recording means for recording an image on the
basis of an image signal input by any of said plural
5 input means;
masking means for masking the image to be recorded
by said recording means; and
control means for controlling a masking area of
said masking means, on the basis of by which of said
10 plural input means the image data was input.

22. An apparatus according to Claim 21, wherein
said plural input means include at least reading means
for reading an original image, and reception means for
15 receiving the image data from a host computer.

23. An apparatus according to Claim 22, further
comprising masking control means for expanding an image
area up to the vicinity of a sheet edge by reducing the
20 masking area of said masking means when the image is
recorded based on the image signal from said reception
means.

24. An apparatus according to Claim 23, further
25 comprising means for permitting said masking control
means to reduce the masking area when the image is
recorded based on the image signal input from said

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reception means, and inhibiting said masking control means from reducing the masking area when the image is recorded based on the image data read by said reading means.

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25. An image formation apparatus comprising:

reading means for reading an original image;

reception means for receiving an image signal from a host computer;

10 recording means for recording an image on the basis of the image signal input by said reading means or said reception means;

masking means for masking the image to be recorded by said recording means; and

15 control means for controlling a masking area of said masking means, on the basis of by which of said reading means and said reception means the image signal was input.

20 26. An apparatus according to Claim 25, further comprising:

masking control means for controlling, in order to expand an image area up to the vicinity of a sheet edge, said masking means to reduce the masking area on the basis of reception of a command to reduce the

25 masking area of said masking means; and means for permitting the reduction of the masking

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area only when the image is recorded based on image data input by said reception means.

27. An apparatus according to Claim 25, wherein
5 said masking means comprises

masking signal generation means for
generating a masking signal, and

logical calculation means for performing
logical calculation to the image signal and the
10 masking signal generated by said masking signal
generation means.

28. An apparatus according to Claim 25, wherein
said recording means comprises

15 a semiconductor laser,
means for scanning a laser beam generated by
said semiconductor laser, and

detection means for detecting the laser beam
scanned by said scanning means.

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29. An apparatus according to Claim 28, wherein
said masking means masks the laser beam in a main
scanning direction and a sub scanning directions of the
laser beam.

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30. An apparatus according to Claim 28, wherein
said masking means controls masking in a main scanning

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direction on the basis of a detection signal of said detection means.

31. An image masking control method comprising:

5 an input step of inputting an image from any of plural input means for inputting image data;

 a masking step of masking the image to be recorded;

10 a masking control step of controlling a masking area in said masking step, on the basis of by which of the plural input means the image data was input; and

 a recording step of recording the image on the basis of an image signal input from any of the plural input means in said input step.

15 32. A method according to Claim 31, wherein the plural input means include at least a reading means for reading an original image, and a reception means for receiving the image data from a host computer.

20 33. A method according to Claim 32, wherein, in said masking step, when the image is recorded based on the image signal from the reception means, an image area is expanded up to the vicinity of a sheet edge by
25 reducing the masking area in said masking step.

34. A method according to Claim 33, wherein it is

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wherein it is permitted in said masking control step to reduce the masking area only when the image is

recorded based on image data input in said reception step.

37. A method according to Claim 35, wherein said
5 masking step comprises

a masking signal generation step of
generating a masking signal, and

a logical calculation step of performing
logical calculation to the image signal and the
10 masking signal generated in said masking signal
generation step.

38. A method according to Claim 35, wherein said
recording step comprises

15 a step of scanning a laser beam generated by
a semiconductor laser, and

a detection step of detecting the laser beam
scanned in said scanning step.

20 39. A method according to Claim 38, wherein said
masking step masks the laser beam in a main scanning
direction and a sub scanning directions of the laser
beam.

25 40. A method according to Claim 38, wherein said
masking step controls masking in a main scanning
direction on the basis of a detection signal in said

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detection step.

41. An image formation apparatus comprising:
scanning means for scanning plural lasers;
5 input means for inputting image data corresponding
to the plural lasers; and
generation means for generating a masking signal
to control light emission of each of the plural lasers,
wherein the plural masking signals are generated
10 by said generation means at mutually independent
timing.

42. An apparatus according to Claim 41, further
comprising detection means for detecting a laser beam
15 scanned, so as to generate a sync signal.

43. An apparatus according to Claim 42, wherein
said generation means generates each of the plural
masking signals on the basis of each of the plural
20 laser beams detected by said detection means.

44. An apparatus according to Claim 43, wherein
said generation means generates each of the plural
masking signals on the basis of the single laser beam
25 detected by said detection means.

45. An image masking control method comprising:

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a scanning step of scanning plural lasers;
an input step of inputting image data
corresponding to the plural lasers; and
a generation step of generating a masking signal
5 to control light emission of each of the plural lasers,
wherein the plural masking signals are generated
in said generation step at mutually independent timing.

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10 46. A method according to Claim 45, further
comprising a detection step of detecting a laser beam
scanned, so as to generate a sync signal.

15 47. A method according to Claim 46, wherein said
generation step generates each of the plural masking
signals on the basis of each of the plural laser beams
detected in said detection step.

20 48. A method according to Claim 47, wherein said
generation step generates each of the plural masking
signals on the basis of the single laser beam detected
in said detection step.

ABSTRACT OF THE DISCLOSURE

The image formation apparatus satisfies a user's demand to effectively use a sheet by writing an image to the marginal sheet edge, and prevents that toner is not transferred to the sheet but adhered to a transfer roller when the sheet is slightly misregistered from its accurate position, whereby back stain occurs in a next sheet. In this apparatus, an area in which the image is masked is changed by a CPU, according to an input mode of a image signal from an image signal generation unit. In a printer mode that the image signal is input from a host computer, image masking signals by which an image can be formed up to the sheet edge are given to gate circuits so as to expand the image up to the marginal sheet edge. In a mode that the image signal is input from an image reader, the image masking signals by which a margin can be provided at the sheet edge are given to the gate circuits so as to limit an image area.

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FIG. 1

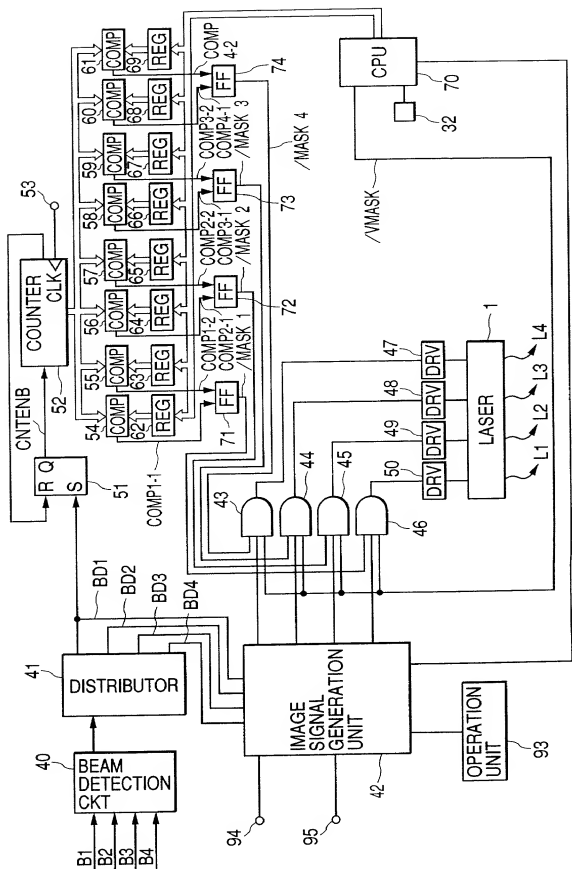


FIG. 2

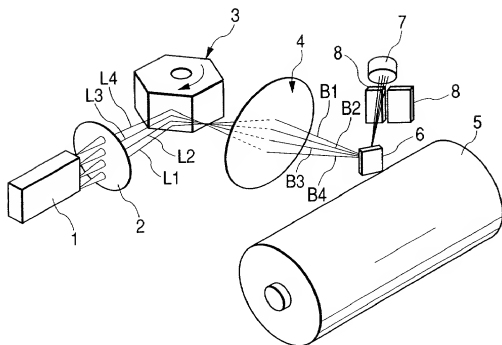


FIG. 3

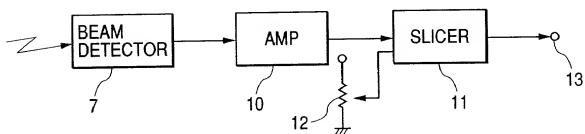


FIG. 4

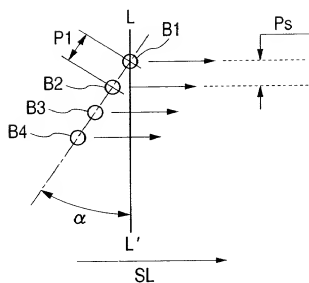


FIG. 5

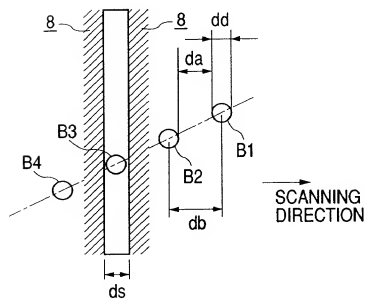


FIG. 6

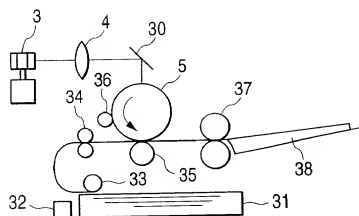


FIG. 7

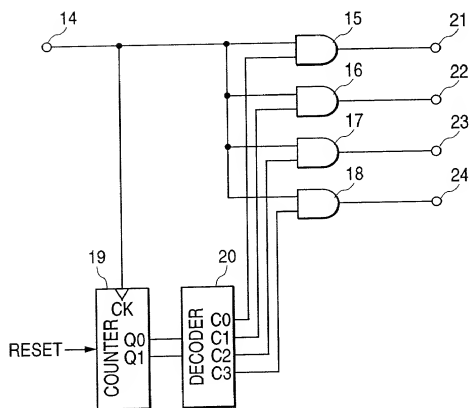


FIG. 8

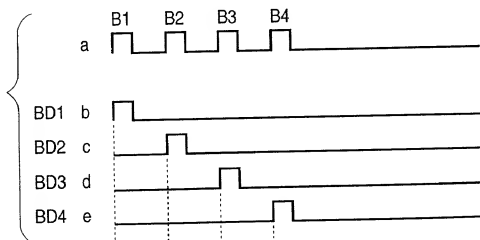


FIG. 9

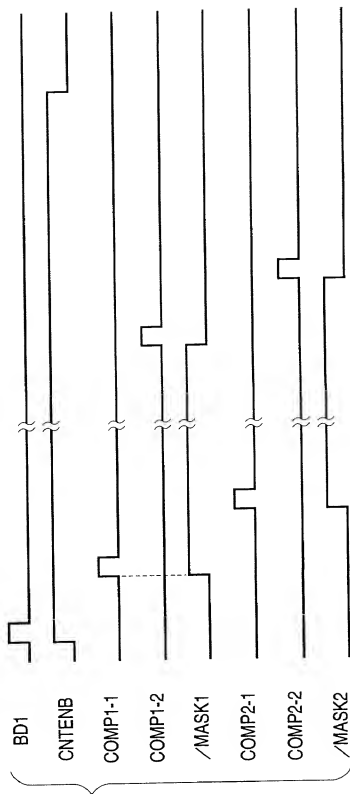


FIG. 10

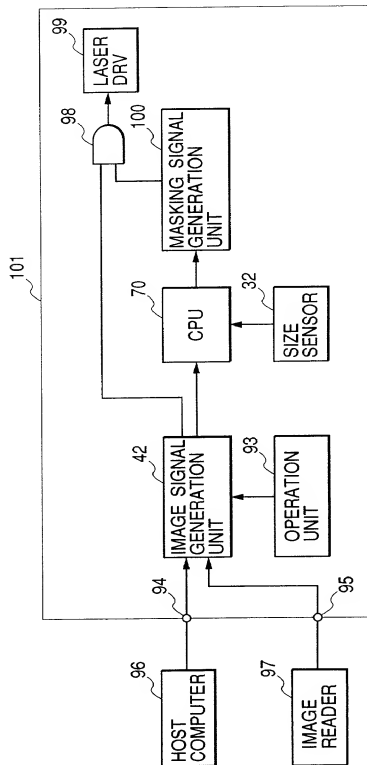


FIG. 11

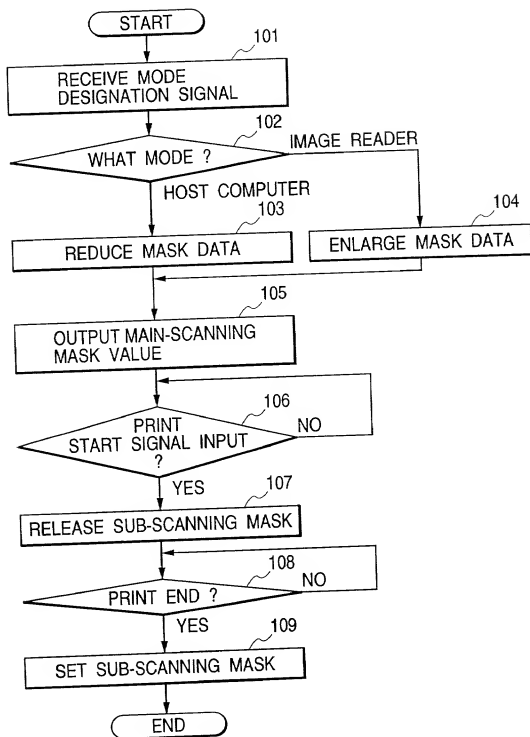


FIG. 12

